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ISTANBUL
TRANSFERABILITY PACKAGE

UP2030 UPSCALING PHASE

UP2030

EXECUTIVE SUMMARY

The purpose of this document is to transfer the knowledge and results acquired by the city of Istanbul during the UP2030 project, so that the prototype developed can be replicated or scaled up both in other parts of the city and in other cities seeking innovative solutions for sustainable urban development. This 'transferability package' contains information about the scaling methodology designed in UP2030, defining the key concepts to be taken into account for its effective implementation in cities. The following sections of this document also provide a detailed account of how Istanbul has implemented the methodology in its local context, along with the results obtained from the process:

- Definition of the objectives for the upscaling phase for the city, specifying which are the dimensions that will be addressed and the impact generated with the actions.
- List of barriers when it comes to upscaling and measures proposed to overcome these. Some of these measures could be recommendations obtained from the finance and governance tools.
- Definition of a plan for upscaling the prototype, collecting the next steps for design and implementation and assigning roles and responsibilities among the actors involved.
- Provide a list of guidance materials and resources to inform key stakeholders about the upscaling phase and the activities that need to be conducted.

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GLOSSARY

Replication: transfer of a tested or proven interventions or initiatives to a different location at the same scale, in order to repeat success elsewhere and achieve similar results.

Upscaling: ability to take a tested concept, pilot project or initiative, and expand it while maintaining efficiency, in terms of people served, revenues generated, or other similar targets.

Prototype: initiatives, plans, programs or solutions developed by cities during the UP2030 project.

Learning Action Alliance (LAA): knowledge exchange and co-creation platforms intended to support the communication, coordination, innovation, and dialogue between city stakeholders at multiple levels.

THE IMPORTANCE OF UPSCALING – UP2030 UPSCALING METHODOLOGY

In projects such as UP2030, it is essential to devise a strategy for sustaining the work carried out during the project and maximising its impact. Due to this reason, the UP2030 project built an **upscaling methodology** to provide cities with instrument and resources developed during the project, so that the prototypes developed during the project can be grown and adapted to other sectors, regions and countries, in order to accomplish the goals defined by each city. This process ensures that best practices are transferable and adaptable across different urban contexts.

The success of the replication or upscaling efforts is completely reliant on the institutional environment in which the actions will be implemented. Therefore, it is essential to create an "enabling environment", which is constituted primarily by:

Finance

Mechanisms for accessing financial, technical and political support.

Governance

Supportive policy, legal and regulatory frameworks and better policy coordination.

Capacity

Enhanced capacity across all levels of government.

The upscale methodology was structured in three phases:

1. PREPARATORY WORK

Setting the basis for upscaling

- Understand the local context, challenges and priorities of cities.
- Define the objectives for upscaling.
- Explore the available tools on governance and finance that support upscaling.

2. LAA WORKSHOP

Bringing local stakeholders to the process

- Set the scene, presenting the objective and defining the resources and capacities to move forward.
- Create readiness among the stakeholders at the local level.
- Design an initial implementation plan for upscaling actions.

3. FOLLOW-UP WORKSHOP

Refining the next steps

- Analyse the main insights and results obtained in the LAA workshop.
- Define next steps for the implementation of upscaling activities.
- Develop a transferability package, collecting information about objectives, opportunities, barriers, actions and resources needed for upscaling.

One of the key outcomes of this process is the **transferability package**, which is designed to serve as a guidance document for cities to assist them in transitioning from the planning phase to the implementation phase of upscaling activities. The transferability package is also designed to facilitate the communication of results with relevant stakeholders within the municipality, as well as with other local and regional governments seeking to learn from best practices.

INTRODUCTION OF THE CITY

Istanbul is the most populated city in Europe and faces huge challenges with urban density despite its urban sprawl. In recent years, the city has experienced intense heatwaves accelerated by climate change. An inefficient transport system and the poor design and low efficiency of existing buildings, particularly in low-income neighbourhoods, have given rise to high energy consumption and emissions. As a signatory of the C40 "Deadline 2020" initiative, Istanbul is committed to become a carbon neutral city by 2050. The city's C40 Climate Action Plan, developed in 2021, outlines ambitious greenhouse gas emission reduction targets, addressing key challenges such as high emissions from buildings and transportation, poor air quality, and an energy-inefficient building stock that lacks climate resilience. Through UP2030, Istanbul aims to sharpen decision making to advance its planning agenda by initiating positive energy neighbourhoods with the use of advanced computational methods in support of decision-making.

From vision to action

CITY'S VISION

Forge a pioneering region in Kadıköy with green energy, smart infrastructure and community vitality:

- Ensure that social equity and inclusivity is embedded in every strategy, from urban planning to environmental policy.
- Follow an integrated sustainable development approach.
- Commit to environmental innovation and resilience, to respond to environmental challenges.
- Create a pilot for positive energy districts.

PROTOTYPE

Integrated Digital Twin Framework

Istanbul's adaptive pathway

With this prototype, Istanbul aims to create a data-driven and practical approach to decarbonisation through the transformation of Kadıköy neighbourhood into a model for climate-neutral urban districts. The **Integrated Digital Twin Framework** is consisted by three main components that can also exist as standalone tools (see below). Combining the power of AI and digital twin technology, the pilot integrates renewable energy solutions and e-mobility infrastructure to support the transition towards Positive Energy Districts and clean mobility solutions, offering a replicable framework for dense urban areas. The prototype will support urban planners, municipalities, residents, researchers and private sector stakeholders in decarbonizing building energy use and transportation in cities.

The people and tools needed for developing the adaptive pathway:

- **Middle East Technical University (METU)** and **Center for Solar Energy Research and Applications (ODTÜ-GÜNAM)**: Developers of the **UBEM/UBTEM AI decision tools** and the Urban furniture.
- **CIRCE-Centro Tecnológico**: Responsible for the **LCA module**.
- **Gruppo Maggioli**: Developer of **MIRA digital twin platform**.
- **ISTON**: Producer of **custom-designed 3D printed concrete urban furniture**.

UPSCALING FOR ISTANBUL

The main objective of Istanbul for the upscaling phase is to assess how the developed tools and practices could be adapted to different local contexts in Istanbul. Four potential areas were chosen by upscaling workshop participants (Beşiktaş, Ataşehir, Eyüpsultan, and the Princes' Islands (Adalar)), with the aim to integrate those technical solutions with local decision-making, financial sustainability, and socio-cultural dynamics. These are the main characteristics and challenges identified for the four sites:.

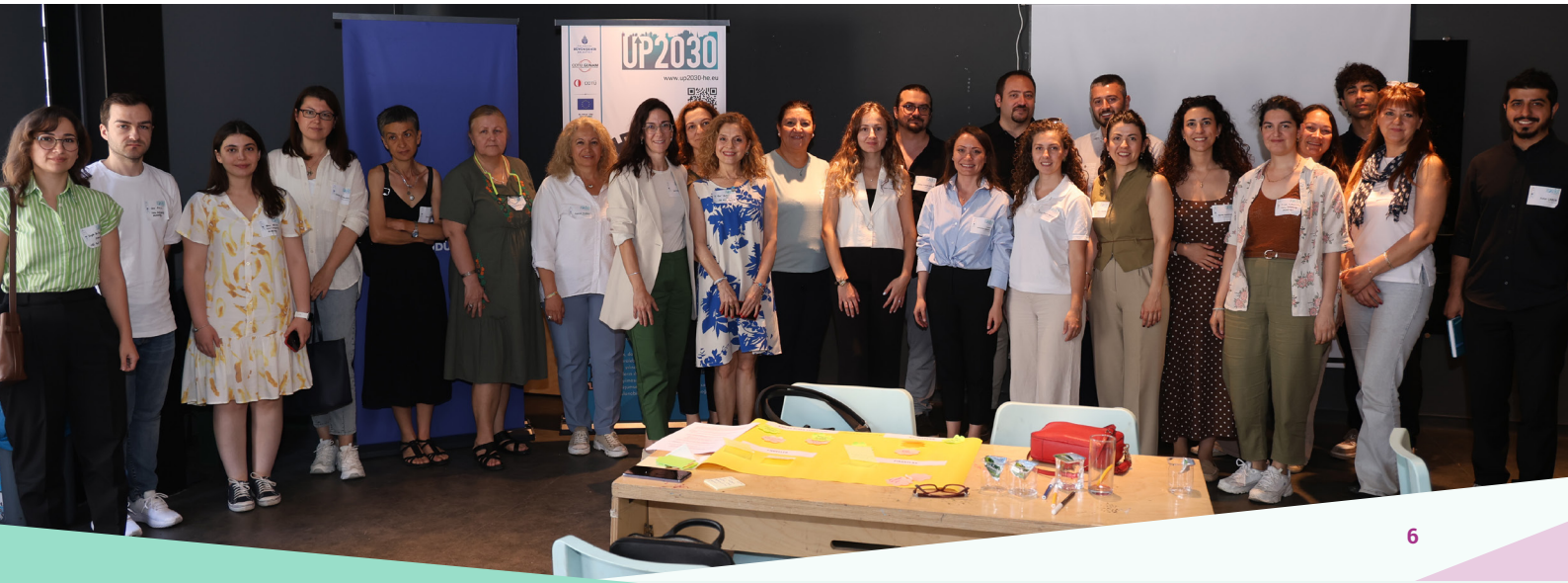
- **Beşiktaş**: there is a need for urban regeneration, as the building stock is outdated and there is a lack of technical infrastructure.
- **Ataşehir**: this neighbourhood is characterised by high-rise buildings and dense urban areas.
- **Eyüpsultan**: this area contains buildings with high historical and cultural value, and therefore the preservation of the cultural heritage is something to be considered.
- **Adalar**: the access to these islands is often challenges due to transportation issues. In addition, the buildings in the area are old and need to be renovated.

The LAA workshop that was organized as part of the upscale phase was pivotal for brainstorming about the integration of solutions developed in UP2030 in these 4 areas. The workshop, which gathered around 30 stakeholders mainly from the Istanbul Metropolitan Municipality and Kadiköy District council, was structured with an interactive and participatory methodology. Participants were divided into four groups and focused on specific districts of Istanbul, taking as a reference the results obtained in the Kadıköy pilot site. Each group discussed the feasibility of implementing renewable energy systems, the integration of digital twin technologies, and the dissemination of PV-integrated urban furniture in their assigned district. Discussions were organized under the themes of stakeholder roles, decision-making processes, implementation barriers, financial mechanisms, priority areas for implementation and potential opportunities.

The digital decision support tool (UBEM) played a key role in these discussions. The interface allowed participants to compare scenarios based on indicators such as energy consumption, indoor comfort, CO emissions, and system efficiency—thus directly supporting local strategy-making. The workshop demonstrated the importance of evaluating the technical tools mentioned above alongside social and governance dimensions. The following sections provide an overview of the main results achieved by Istanbul in the upscaling phase, including the barriers and opportunities encountered together with local stakeholders, key decisions made, and a plan for next steps.

What are the barriers that need to be overcome with upscaling?

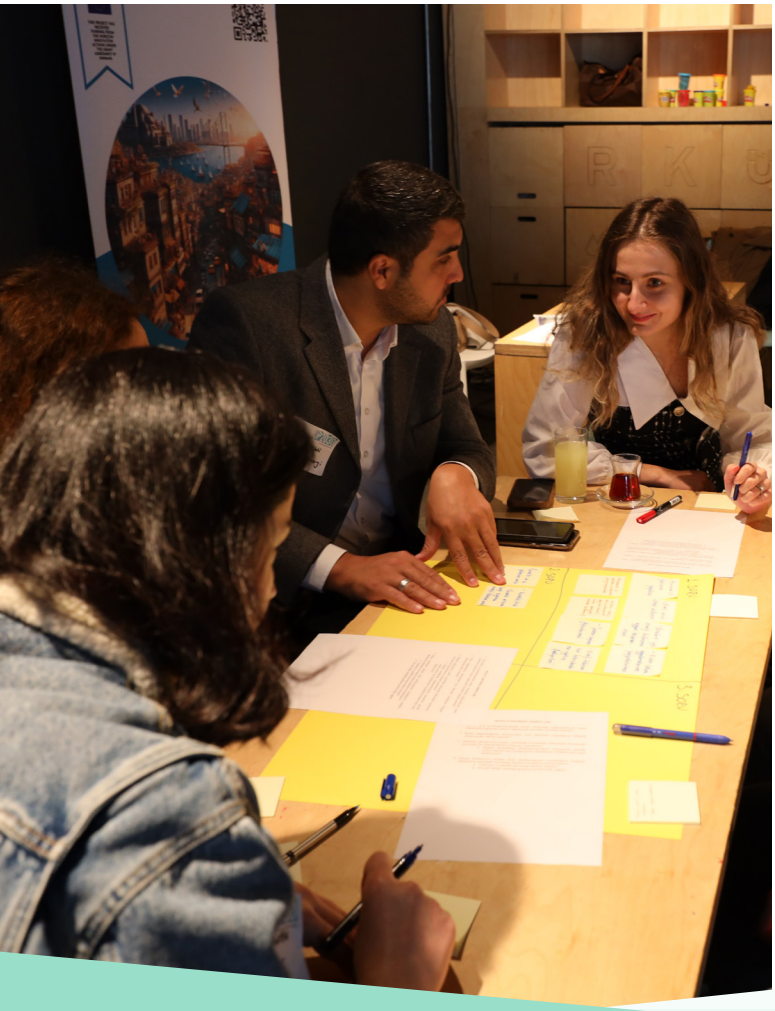
- There are **legal gaps and uncertainties for all districts in Istanbul. Regulation is needed at national level** for the integration of innovative technologies and renewables in the local level and accelerate implementation.
- **Lack of supportive mechanisms at the local level**. As a municipal government, Istanbul Metropolitan Municipality has **limited room on what can be done**, as it is not possible for it to change national regulations.



- In relation to infrastructure, there is a **lack of infrastructure to support the implementation of the PV panels**. For instance, in Ataşehir, while the urban density is high, there is a limited area for PV integration (there are too many flats in the same building). In Adalar, due to the classification as cultural heritage, there is a barrier in implementing the PVs in these buildings.

- There is a **lack of incentives and funding mechanisms for PV integration**, which has a direct impact on the awareness level of both policy makers and citizens. **Awareness is needed for accessing funds**; building owners usually do not care much about the status of the buildings, as they do not live there and there is no economic profit for them if they renew the buildings. For citizens, the return of investments on PV integration and building retrofitting is very low, and the electricity cost is also low, so there are **no incentives for implementing PV**.

- Issues such as **vandalism/lack of security and maintenance of installations** is an important factor to be taken into account for planning the interventions in other areas; this will require fostering acceptance and responsibility among citizens.



What are the opportunities that have been found in the upscale phase?

- **Multi-stakeholder collaboration**. Actors from different groups need to be involved in the planning and decision-making processes: citizens, local governments (bringing expertise from different departments), project implementers and financing actors.

- Need to **showcase the financial benefits alongside with sustainability**, in order to gain the trust of the local residents.

- **Integration of PV panels** could be **included in the retrofitting process**, in order to make the installation of PV panels more affordable and align with other plans and strategies.

- In Beşiktaş, there are **new photovoltaic firms and ongoing retrofitting projects of public buildings**, which could offer new testing opportunities for the prototype and expand its impact.

- **Ataşehir district has a high socioeconomic profile**. In contrast to low-income neighbourhoods, where the use of PV panels is not a priority, there might be a **higher opportunity to renovate the buildings** following the approach developed in UP2030.

- In **Eyüpsultan**, there are **new open spaces and photovoltaic-ready roof designs**, which are good conditions to implement new projects.

- **Tourism potential is high in Adalar**, which combined with the low-rise building stock in the area, could be a **good opportunity for the integration of green technologies**.

- In addition, the prototype itself offers the **following opportunities, regardless of the local context for upscaling**:
  - New Business Fields: PV companies, energy consultants.
  - Aesthetics + Sustainability: Visibility through PV-integrated furniture.
  - Participation: Digital twin interface allows non-technical users to engage.
  - Education: Innovative awareness programs for youth.
  - Tourism: Development of scalable models in areas like Adalar.

Enabling the environment: governance and finance

Governance and finance are essential components of an upscaling plan. During the first phase of the upscaling methodology (preparatory work), the city of Istanbul went through the finance and governance aspects, taking as a reference the **tools** developed by the Global Green Growth Institute (GGGI) and adelphi, respectively, and explored how these resources could help them shape an enabling environment for their upscaling plan. The key findings obtained from this initial phase were then discussed with the stakeholders of the Learning Action Alliance. The main results of the discussion are detailed below.

Governance

The implementation of technical solutions such as the one developed in Istanbul is sometimes complex due to various social and governmental factors that must be taken into account. Based on discussions with local stakeholders at the LAA workshop, the need to effectively communicate the benefits of such solutions to society at large has been highlighted, so that future projects in different districts of the municipality are viewed favourably by citizens. Proof of the importance of public opinion for the municipality is the survey they created to evaluate the public's usage frequency, preferred features, locations, and feedback for photovoltaic integrated urban furniture systems. The results of the survey indicated a strong public interest in PV-integrated urban furniture.

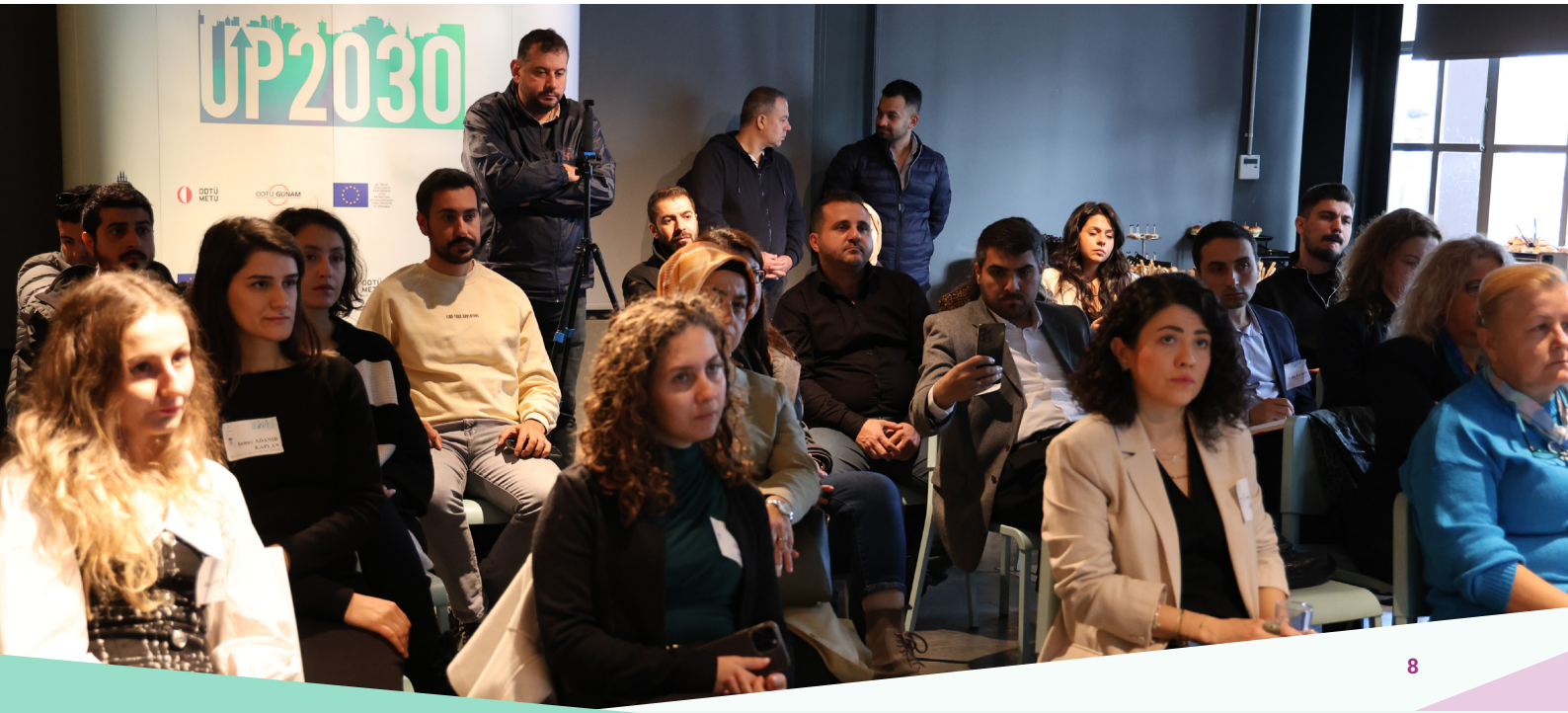
However, Istanbul will need to work to overcome legislative and regulatory barriers that prevent these projects from being carried out. One possible way to do this is by trying to build bridges between local and national governments, so that local government gains more capacity to implement green and innovative technologies that directly benefit citizens. To this end, it is necessary to design solid strategies, with the contribution of all relevant stakeholders, as has been done in Istanbul in the UP2030 project.

Finance

One of the financing aspects, Istanbul highlighted the need to simplify current financial requirements. Which often goes hand-in-hand with regulation issues. Istanbul expressed the necessity of making incentives and funding mechanisms for PV integration available for citizens and organisations. Demonstrating that these types of solutions are feasible for daily use is the first step, but it will also be necessary for various stakeholders, such as financial institutions and central government, to offer integrated solutions to citizens and local authorities.

In addition, exploring other funding opportunities will be necessary for Istanbul. Even if the financing tools of GGGI have not been used in the development of the prototype, they might be considered for future applications. Istanbul has mapped the following funding opportunities:

- **EU Funds**: Horizon Europe, Green Deal, IPA
- **National Sources**: Municipal and ministry budgets
- **Private Sector**: Urban furniture production and sponsorship
- **Carbon Credits**: Green building certificates, tax incentives



Greening the city - Action plan for the next steps

Following the completion of the Kadıköy pilot, the next phase is envisioned as a structured transition towards wider dissemination, increased stakeholder uptake, and future scaling across Istanbul. The coming period is planned to focus on expanding the visibility and usability of the developed PV potential assessment, the digital twin–based decision support tool, and PV-integrated urban furniture. In addition to institutional and technical stakeholders, particular emphasis is foreseen on strengthening citizen-level engagement through the dissemination of the Istanbul booklet and the communication of project outcomes via accessible digital channels. Through targeted communication activities, engagement with district municipalities, academia and the private sector, and continued knowledge production, this phase aims to create the enabling conditions for broader adoption. In parallel, exploring European funding opportunities and preparing for a first wave of applications in public buildings and public spaces are anticipated as key steps to support the long-term integration of the pilot outcomes into urban energy and mobility planning processes.

End of 2025

January – February 2026

- Dissemination of the impact & performance report of the pilot model study (Kadıköy).
- Dissemination of the booklet prepared for Istanbul—social media-website.
- In awareness-raising activities, include project work and results in future public events.

April – May 2026

- Organising meetings with the local administrations of Istanbul's 39 districts, academia, and the private sector regarding the use of the tool.
- Encouraging the use of digital twin-supported tools as decision support systems.
- Communicating with institutions wishing to actively use the tool regarding requirements (data tempaltes, inputs etc.)

June-July 2026

- Communication with İSTON (IMM affiliate) to support the replication of PV-integrated furniture.

September – October 2026

- Organising meetings with the local administrations of Istanbul's 39 districts, academia, and the private sector regarding the use of the tool.
- Encouraging the use of digital twin-supported tools as decision support systems.
- Communicating with institutions wishing to actively use the tool regarding requirements (data templates, inputs etc.).

November-December 2026

- Applying for EU funding to support the development of the project's digital twin modelling and artificial intelligence studies.
- Planning for the first wave of implementation in public buildings & public spaces.

TOOLS' CONTRIBUTION TO THE PROTOTYPE AND POST-PROJECT USE

Istanbul aims to assess how the developed tools and practices could be adapted to different local contexts in Istanbul. This includes integrating digital twin technologies and renewable energy solutions into urban planning processes, increasing data standardisation, and encouraging citizen engagement. The development of the Integrated Digital Twin Framework was made thanks to different technical tools; this section defines how the use of these tools is envisioned for the future:

UBEM/UBTEM AI decision tools (METU and ODTU-GUNAM)

The **UBEM/UBTEM AI decision tools** support Istanbul in achieving local decarbonisation goals by enabling the city to plan and implement renovation strategies across its aging and energy-inefficient building stock, monitoring progress over time and aligning with national and EU climate commitments. It is envisioned the tools will be used by the pilot city beyond the end of the project; the tools are not static and will evolve with the city's own dataset and priorities. Therefore, decision-makers can continue to use the tools to evaluate and compare renovation strategies for decarbonization from different perspectives, including ecological, economic and thermal comfort.

Life Cycle Assessment (CIRCE)

The **LCA tool** generates environmental, economic, and social benefits that support sustainable urban development and accelerate progress toward Net-Zero goals. By updating the actual database, the tool provides a solid base information that can be used to create future scenarios that allow for effective planning of sustainable and energy efficient building interventions and renovations. However, it is not foreseen the tool being used by the pilot city beyond the end of the project, but the data received from the pilot can be integrated into broader datasets for data driven decisions in the future for the public stakeholders in Istanbul.

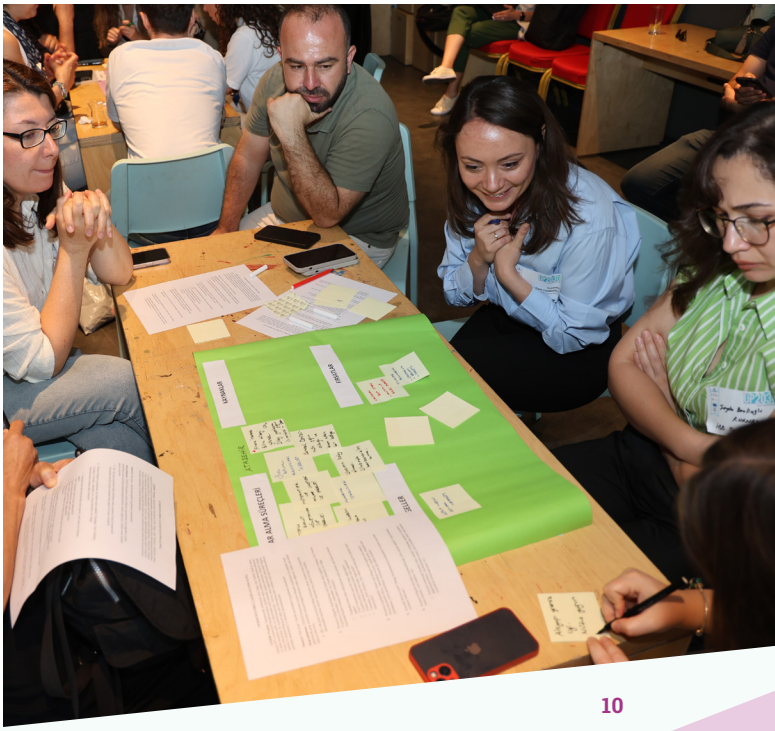
MIRA digital twin platform (MAGGIOLI)

The **MIRA digital twin platform** enables evidence-based urban planning aligned with the city's sustainability roadmap. In the long term, MIRA can help Istanbul meet its climate neutrality and smart city targets by continuously tracking and reducing energy use and GHG emissions. The city will continue having access to the tool at least one year after the project, but as requires paid services, the city will need to decide whether it will expand the pilot to full scale by providing the required city-scale data, which will entail additional costs for the municipality.

Neutrality Story Maps (VUB and CERTH)

By showcasing the work of the pilots and their prototypes in an accessible format with success stories, lessons learned and future strategies, **Neutrality Story Maps** allows other neighbourhoods in the city to learn and adopt similar climate neutrality strategies and approaches.

The tool has been embedded in the communication strategy for the project by Istanbul, who is using the tool to communicate their activities in UP2030 to the general public in an accessible multimedia narrative format. The city expressed interest in using the platform for at least the next five years that will be freely accessible.



TRANSFERABILITY OF THE PROTOTYPE

Istanbul is a good example for cities looking to develop technical studies and analyses that use data and engagement techniques, to be tested at a pilot scale physical implementation. In UP2030, one of the objectives that has been defined in the upscale phase is to maximise the impact of the prototypes developed during the project, expanding them to other sectors, regions and countries.

To this end, it is extremely important to understand the characteristics of the context of the place where the prototypes are to be scaled up or replicated. To facilitate this process of transferring processes and results, the UP2030 project has developed four Urban Typologies with over 1000 provinces each in order to identify provinces, covering almost all of Europe, that have similarities based on different indicators that have been analysed. By grouping European regions with similar attributes, the Urban Typologies aims to foster targeted collaboration and encourage knowledge-sharing and communication for more effective solutions, especially between regions and cities sharing similar opportunities and challenges.

Four distinct typologies have been created:

- **Capacity for action**: Considers socio-economic factors and governance indicators.
- **Contributions to mitigation**: Focuses on sectoral emissions, carbon sequestration capacity and renewable energy potential.
- **Climate hazards**: Focuses on prevalent climate hazards and exposure.
- **Urban morphology**: Focuses on urban landscape and infrastructure characteristics such as urban density, land use types, etc.

For each typology, respectively, these are the clusters that correspond to the province in which Istanbul is located (Istanbul Metropolitan Municipality), and hence which most closely resemble the province Istanbul Metropolitan Municipality:

CAPACITY FOR ACTION

Touristic Destinations

Spanning across Europe, with particular prominence along the Mediterranean coastlines of France and Spain, as well as the Alpine regions of Northern Italy and Austria, this cluster is characterised by **very high tourism activity** and a **large population size**. It boasts a **strong workforce and robust economy**, alongside an **average level of institutional trust and effectiveness**. The proportion of protected areas is relatively high, especially when compared to other clusters with similarly high levels of urbanisation.

CONTRIBUTIONS TO MITIGATION

High industrials emissions and average renewables potential

This cluster is defined by its **extremely high industrial CO_2 emissions** – the highest in the study area, combined with **high emissions from buildings and vehicles, and a very high urbanization rate**. The regions of this cluster are sparsely distributed mostly throughout the Netherlands, Germany, Poland, and Czech Republic. This cluster has **high photovoltaics potential and very high wind energy potential**, offering substantial opportunities for renewable energy deployment. **Forests and wetlands are sparse**, suggesting the need for systemic restoration strategies. Covering only 4% of the study area, the cluster accounts for 10% of the population and 13% of the urban population, highlighting the **concentration of people therein**.

CLIMATE HAZARDS

Highest exposure to flooding in pockets of Europe

This cluster with multiple large capitals is **densely populated and highly urbanized**, and scattered across **heterogeneous landscapes**, including alpine, coastal, semi-arid Mediterranean, and secondary mountain ranges in **Central and Eastern Europe**. Its defining characteristic is the **very high exposure to pluvial, fluvial, and coastal flooding**, driven by diverse geographical, hydrological, and meteorological conditions. **High heat stress and high air pollution** (moderate risk according to WHO Air Quality Guideline (AQG) 2021) are additional critical hazards, while landslide and wildfire risks are moderate. The cluster faces **complex, multi-hazard challenges requiring integrated adaptation**. The cluster is closely related to the cluster "Heat hazard and air pollution in lowlands and basins in southern and eastern Europe" with respect to air pollution, heat stress and wildfire.

URBAN MORPHOLOGY

High-density urban centres with minimal open space

This cluster is found in the major metropolitan areas of Europe and is also widespread throughout Spain. It is characterised by a **very high population density** and an exceptionally **large proportion of densely built-up areas**—both significantly higher than in any other cluster. **Industrial and commercial zones occupy a substantial share** of the urban landscape. **Green spaces are limited**, while **impervious surfaces are extensive**. The terrain is relatively flat, with only a small proportion of the urban area situated on steep slopes.

For each of these four typologies, and for all clusters constituting the typologies, the following useful information is highlighted and can be explored: a short characterization, common challenges and opportunities in each cluster, as well as key areas for action and example measures and instruments therein.

In doing so, clusters can support urban planners and decision-makers in identifying strategic priorities, in addressing climate challenges more effectively, and with knowledge transfer between similar provinces, across Europe.

Istanbul can serve as an example for other cities in these clusters, i.e. with these similar characteristics that are seeking to develop sustainable, climate-resilient and inclusive strategies for their local contexts. However, it should be noted that these typologies do not restrict the scope for replication and scaling up (i.e., the Istanbul prototype is not only applicable in places classified within these four typologies), but rather help to identify places where the transfer of this package of Istanbul is most likely to be successful. In addition, it goes without saying that these clusters cannot replace province or city case studies, and not be used as such. The clusters are on a province level.

*To explore the typologies, use the **interactive map**.*

*The full list of indicators is also found in the **methodology section**.*

KEY MESSAGE FROM THE CITY

"Currently there are legal gaps and financial uncertainties for all districts in Istanbul. Supportive mechanisms are needed at the national level that enable the integration of innovative technologies and renewable energy projects at the local level, and this can only be achieved by multi-stakeholder collaboration."

CITY CONTACT

Ece ÖZÖN (ece.ozon@ibb.gov.tr)
Director of Climate Change Directorate

Berfin KAHRAMAN (berfin.kahraman@ibb.gov.tr)
Deputy Director of Climate Change Directorate

Elvin ÖKSÜZ BAYAZIT (elvin.bayazit@ibb.gov.tr)
Environmental Engineer

Ahmet URUN (ahmet.urun@ibb.gov.tr)
Environmental Engineer

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All images: UP2030 Istanbul team

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